This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.

Designation: D2213 – 00 (Reapproved 2020)

Standard Test Method for Compressibility of Leather[1]

This standard is issued under the fixed designation D2213; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

This standard has been approved for use by agencies of the U.S. Department of Defense.

1. Scope

1.1 This test method covers the determination of the compressibility of sole leather. This test method does not apply to wet blue.

1.2 The values stated in inch-pound units are to be regarded as standard. The values given in parentheses are mathematical conversions to SI units that are provided for information only and are not considered standard.

1.3 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.4 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 *ASTM Standards:*[2]

D1610 Practice for Conditioning Leather and Leather Products for Testing

D1813 Test Method for Measuring Thickness of Leather Test Specimens

3. Terminology

3.1 *Definitions:*

3.1.1 *compressibility*—the percentage change in thickness of a specimen on being subjected to a specified pressure for a period of time.

4. Summary of Test Method

4.1 A load of 12 000 lbf (53 kN) or 3000 psi (21 MPa) is applied to a leather specimen 2 by 2-in.^{2} (51 by 51-mm^2). The percentage change in initial thickness, determined by measuring thicknesses before and after compression, represents the compressibility of the sample.

5. Significance and Use

5.1 Compressibility is considered an important factor that influences wear resistance of sole leather.[3,4]

6. Apparatus

6.1 *Press,*[5] either hand- or power-driven, having a capacity of at least 15 000 lbf (67 kN) permitting a pressure of 3000 ± 100 psi (21 ± 1 MPa). The rate of increase shall not exceed 200 psi/s (1.4 MPa/s). The press shall contain two flat steel plates and an indicator for reading the applied force. A suitable testing machine may also be used.

6.2 *Stop Watch,* or other suitable timing device.

7. Test Specimen

7.1 The specimen shall be a square of leather 2 by 2 ± 1/32 in. (51 by 51 ± 0.8 mm) cut by a die.

8. Procedure

8.1 Condition the specimens in accordance with Practice D1610.

8.2 Measure the initial thickness of the specimen at the middle of each side approximately 0.5 in. (12.7 mm) from the edge in accordance with Method D1813 averaged and recorded as T_1.

[1] This test method is under the jurisdiction of ASTM Committee D31 on Leather and is the direct responsibility of Subcommittee D31.01 on Vegetable Leather. This test method was developed in cooperation with the American Leather Chemists Assn. (Standard Method E45 – 1953).

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[2] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

[3] Hobbs, R. B., and Kronstadt, R. A., *Journal of the American Leather Chemists Association JALCA.*, Vol 40, 1945, p. 12.

[4] Booth, W. E., *Journal of the Society of Leather Trades' Chemists*, Vol 43, 1959, p. 349

[5] The sole source of supply of the hand press known to the committee at this time is Fred S. Carver Co., Summit, NJ. If you are aware of alternative suppliers, please provide this information to ASTM Headquarters. Your comments will receive careful consideration at a meeting of the responsible technical committee,[1] which you may attend.

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8.3 Place the specimen between the flat steel plates and apply pressure at a rate not greater than 200 psi/s (1.4 MPa/s) until the required 3000 ± 100 psi (21 ± 1 MPa) is reached.

NOTE 1—The operator shall take care to apply the force uniformly and perpendicular to the leather surfaces.

8.4 Maintain the load for 3 min, continuously correcting for relaxation or loss in force, and then release.

8.5 Remove the specimen from the apparatus and immediately remeasure in accordance with 8.2. Record the final thickness as T_2.

9. Calculation

9.1 Calculate the percentage compressibility as follows:

$$\text{Compressibility, \%} = [(T_1 - T_2)/T_1] \times 100 \quad (1)$$

where:

T_1 = initial thickness of the uncompressed sample, and

T_2 = thickness of the sample after compression.

10. Report

10.1 The report shall include the following:

10.1.1 Compressibility of each specimen from each test unit, and

10.1.2 Compressibility based on the average of all specimens tested, recorded to the nearest 0.1 %.

11. Precision

11.1 The mean difference between two laboratories using seven pairs of matched samples is 1.40 and confidence limits at 95 % are 0.23 to 2.67.

12. Keywords

12.1 compressibility; sole leather; wear resistance

APPENDIX

(Nonmandatory Information)

X1. COMPRESSIBILITY OF FINISHED SOLE LEATHERS

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TABLE X1.1 Interlaboratory Data National Bureau of Standards and U.S. Naval Supply Research and Development Facility

NBS	USNSR & DF	Difference	$(x - \bar{x})$	$(x - \bar{x})^2$
11.0	10.4	0.6	−0.8	0.64
12.4	9.0	3.4	2.0	4.00
10.1	10.1	0	−1.4	1.96
6.5	3.6	2.9	1.5	2.25
8.7	8.5	0.2	−1.2	1.44
8.1	6.3	1.8	0.4	0.16
7.3	6.4	0.9	−0.5	0.25
		9.8		10.70

Mean difference = 1.40
Standard deviation = 1.24
Standard error = 0.52
Confidence limits at 95 % for this mean difference = 1.4 ± 2.45 (0.52) = 0.23 to 2.67

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